What is claimed is:

CLAIMS

- 1 1. An optical manipulation system comprising an array of focusing elements, each of which
- 2 focuses an electromagnetic energy beam from an array of beamlet sources into an array of focal
- 3 spots in order to manipulate a plurality of samples on an adjacent substrate.
- 1 2. The optical manipulation system as claimed in claim 1, wherein said array of beamlet
- 2 sources includes an array of micromirrors.
- 1 3. The optical manipulation system as claimed in claim 1, wherein said array of focusing
- 2 elements includes an array of diffractive elements.
- 1 4. The optical manipulation system as claimed in claim 1, wherein said array of beamlet
- 2 sources includes an array of light emitting diodes.
- 1 5. The optical manipulation system as claimed in claim 1, wherein said array of beamlet
- 2 sources includes an array of semiconductor lasers.
- 1 6. The optical manipulation system as claimed in claim 1, wherein said array of beamlet
- 2 sources includes an array of vertical cavity surface emitting lasers.
- 1 7. The optical manipulation system as claimed in claim 1, wherein said array of beamlet
- 2 sources includes a spatial light modulator.
- 1 8. The optical manipulation system as claimed in claim 1, wherein said array of focusing
- 2 elements includes an array of Fresnel lenses.

- 1 9. The optical manipulation system as claimed in claim 1, wherein said array of focusing
- 2 elements includes an array of zone plates.
- 1 10. The optical manipulation system as claimed in claim 1, wherein said system further
- 2 includes an array of microlenses interposed between said array of sources and said array of
- 3 focusing elements.
- 1 11. A parallel optical manipulation system comprising an array of focusing elements, and an
- 2 array of sources, wherein each source is positioned to selectively direct electromagnetic energy
- 3 toward a focusing element, and each focusing element is positioned to direct a focused beam
- 4 toward a particle to be manipulated.
- 1 12. A parallel optical manipulation system comprising an array of focusing elements, and an
- 2 array of directionally selective elements, wherein each directionally selective element is
- 3 positioned to selectively direct electromagnetic energy toward a focusing element, and each
- 4 focusing element is positioned to direct a focused beam toward a particle to be manipulated.
- 1 13. The parallel optical manipulation system as claimed in claim 12, wherein said array of
- 2 directionally selective elements includes an array of micromirrors.
- 1 14. The parallel optical manipulation system as claimed in claim 12, wherein said array of
- 2 directionally selective elements includes an array of spatial light modulators.
- 1 15. The parallel optical manipulation system as claimed in claim 12, wherein said system
- 2 further includes a single source of electromagnetic energy that is directed toward said array of

- 3 directionally selective elements.
- 1 16. The parallel optical manipulation system as claimed in claim 12, wherein said
- 2 directionally selective elements may each be used to selectively switch on and off said
- 3 electromagnetic energy that is directed toward a respective focusing element.
- 1 17. The parallel optical manipulation system as claimed in claim 12, wherein said
- 2 directionally selective elements are each associated with a focusing element, and said
- directionally selective elements may each be used to selectively move with respect to an
- 4 associated focusing element, said electromagnetic energy that is directed toward the associated
- 5 focusing element.
- 1 18. A parallel optical manipulation system for manipulating particles using electromagnetic
- 2 energy, said system comprising an array of focusing elements and an array of micro-mirrors each
- 3 of which is associated with a focusing element and may be moved with respect to the associated
- 4 focusing element to selectively direct a beamlet of electromagnetic energy toward a plurality of
- 5 selectable locations on said focusing element.
- 1 19. A method of manipulating particles using electromagnetic energy, said method
- 2 comprising the steps of:
- providing an array of beamlets that are directed toward an array of focusing elements;
- 4 focusing each of said beamlets toward a plurality of particles; and
- 5 selectively controlling each of said beamlets to manipulate said plurality of particles.

- 1 20. The method as claimed in claim 19, wherein said step of providing an array of sources to
- 2 provide said array of beamlets.
- 1 21. The method as claimed in claim 19, wherein said step of providing an array of
- 2 directionally selectively elements to provide said array of beamlets.
- 1 22. The method as claimed in claim 21, wherein said directionally selective element includes
- 2 an array of micromirrors.
- 1 23. A method of manipulating particles using electromagnetic energy, said method
- 2 comprising the steps of:
- providing an array of micro-mirrors that receive an electromagnetic field and provide an
- 4 array of beamlets that are directed toward an array of focusing elements;
- 5 focusing each of said beamlets toward a plurality of particles; and
- 6 selectively controlling each of said micromirrors to manipulate said plurality of particles.
- 1 24. The method as claimed in claim 23, wherein said step of selectively controlling each of
- 2 said micromirrors to manipulate said plurality of particles involves stretching an element that
- 3 includes at least two particles.